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09/939,767	08/28/2001	Shunpei Yamazaki	740756-2358	3748

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ERIC ROBINSON
PMB 955
21010 SOUTHBANK ST.
POTOMAC FALLS, VA 20165

EXAMINER	
HOGANS, DAVID L	
ART UNIT	PAPER NUMBER
2813	9

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Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 07-01)

Office Action Summary	**Application No.** 09/939,767	**Applicant(s)** YAMAZAKI, SHUNPEI
	Examiner David L. Hogans	**Art Unit** 2813

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *24 March 2003*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-3,5-7 and 35-61* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3,5-7 and 35-61* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *28 August 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☒ Certified copies of the priority documents have been received in Application No. *09/094,345*.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

This Office Action is in response to Amendment B filed on March 18, 2003.

Status of Claims

Claims 1-3 and 5-7 are pending. Claims 4 and 8-34 are cancelled. Claims 35-61 are newly submitted.

Claim Rejections - 35 USC § 112

The Examiner withdrawals the indefiniteness rejection of Claim 1 pursuant to Applicant's Amendment's in Paper No. 8.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-3, 5-7, 42-46 and 54-61 are rejected under 35 U.S.C. 103(a) as being unpatentable over 5,550,070 to Funai et al in view of 5,459,090 to Yamazaki et al.

Claims 1, 2, 3, 7, 54, 56

Funai et al. teaches: a silicon active layer containing a nickel catalytic element for promoting crystallization (See column 8 lines 33-38), a gate insulating film interposed between a gate electrode and the active layer (See column 9 lines 44-47), and source/drain regions that contain said nickel catalyst (See column 9 lines 55-64).

Funai et al. fails to explicitly teach a gate electrode comprised by a heat resistant material. Additionally, Funai et al. fails to explicitly teach wherein the concentration of nickel in the source/drain regions is two or more orders of magnitude higher than in other regions.

However, Yamazaki et al., in column 8 lines 1-10, teaches a gate electrode comprised by tantalum (melting point of 2985 ^{o}C). Further, Yamazaki, in column 8 lines 10-15, notes that refractory metals, such as tantalum, are commonly employed because they offer lower resistivities. Furthermore, Funai et al., in column 9 lines 55-64 and Figures 1-12, teaches wherein the concentration of said catalytic element in said source (116) and drain (117) regions is higher than the concentrations in other regions (i.e. – the channel region (118)). Finally, Funai et al., in column 5 lines 55-65 and columns 8-9 lines 67-05, teaches that high concentrations of nickel causes current to pass therethrough which adversely effects the electrical stability of TFT's.

It would have been obvious to one of ordinary skill in the art to modify Funai et al. by incorporating a gate electrode comprised by tantalum, as taught by Yamazaki et al., to improve the performance of a TFT device since such technology was well known at the time of the invention. Lastly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to optimize the concentration difference between the source/drain regions and other regions, since it has been held that where

the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233 (CCPA 1955).

Claims 5 and 57

Incorporating all arguments of Claim 1 and noting that Funai et al., in column 20 lines 18-35, teaches wherein the device of Claim 1 can be incorporated into active matrix liquid crystal displays and organic light emitting elements.

Claims 6 and 55

Incorporating all arguments of Claim 1 and noting that Funai et al., in column 4 lines 9-14 and column 14 lines 1-5, teaches a catalytic element selected from the group consisting of Fe, Co, Ni, Pd, Pt, Cu and Au.

Claims 42, 43, 45, 58 and 60

Funai et al. teaches: a silicon active layer containing a nickel catalytic element for promoting crystallization (See column 8 lines 33-38), a gate insulating film interposed between a gate electrode and the active layer (See column 9 lines 44-47), and source/drain regions that contain said nickel catalyst (See column 9 lines 55-64).

Funai et al. fails to explicitly teach a gate electrode comprised by a heat resistant material. Additionally, Funai et al. fails to explicitly teach wherein the concentration of

nickel in the source/drain regions is higher than in other regions which is less than $5x10^{16}$ atoms/cm^3.

However, Yamazaki et al., in column 8 lines 1-10, teaches a gate electrode comprised by tantalum (melting point of 2985 °C). Further, Yamazaki, in column 8 lines 10-15, notes that refractory metals, such as tantalum, are commonly employed because they offer lower resistivities. Furthermore, Funai et al., in column 9 lines 55-64 and Figures 1-12, teaches wherein the concentration of said catalytic element in said source (116) and drain (117) regions is higher than the concentrations in other regions (i.e. – the channel region (118)). Funai et al. specifically points out that high concentrations of nickel are to be avoided in the channel region. Finally, Funai et al., in column 5 lines 55-65 and columns 8-9 lines 67-05, teaches that high concentrations of nickel causes current to pass therethrough which adversely effects the electrical stability of TFT's.

It would have been obvious to one of ordinary skill in the art to modify Funai et al. by incorporating a gate electrode comprised by tantalum, as taught by Yamazaki et al., to improve the performance of a TFT device since such technology was well known at the time of the invention. Lastly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to optimize the channel regions concentration, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233 (CCPA 1955). Furthermore, the

Examiner notes that a channel doped with conductivity enhancing elements (i.e. – nickel) will display lower ON/OFF ratios and larger leakage currents, either of which are not desirable for the intended purpose of the device.

Claims 44 and 59

Incorporating all arguments of Claim 42 and noting that Funai et al., in column 4 lines 9-14 and column 14 lines 1-5, teaches a catalytic element selected from the group consisting of Fe, Co, Ni, Pd, Pt, Cu and Au.

Claims 46 and 61

Incorporating all arguments of Claim 42 and noting that Funai et al., in column 20 lines 18-35, teaches wherein the device of Claim 1 can be incorporated into active matrix liquid crystal displays and organic light emitting elements.

3. Claims 35-41 and 47-53 are rejected under 35 U.S.C. 103(a) as being unpatentable over 5,550,070 to Funai et al in view of 5,459,090 to Yamazaki et al. in view of 5,764,321 to Koyama et al.

Claims 35, 36, 38 and 40-41

Funai et al. teaches: a silicon active layer containing a nickel catalytic element for promoting crystallization (See column 8 lines 33-38), a gate insulating film interposed

between a gate electrode and the active layer (See column 9 lines 44-47), and source/drain regions that contain said nickel catalyst (See column 9 lines 55-64).

Funai et al. fails to explicitly teach a gate electrode comprised by a heat resistant material, wherein the concentration of nickel in the source/drain regions is two or more orders of magnitude higher than in other regions, and wherein a first and second insulating insulator are placed over the device.

However, Yamazaki et al., in column 8 lines 1-10, teaches a gate electrode comprised by tantalum (melting point of 2985 ^{o}C). Further, Yamazaki, in column 8 lines 10-15, notes that refractory metals, such as tantalum, are commonly employed because they offer lower resistivities. Further, Funai et al., in column 9 lines 55-64 and Figures 1-12, teaches wherein the concentration of said catalytic element in said source (116) and drain (117) regions is higher than the concentrations in other regions (i.e. – the channel region (118)). Further, Funai et al., in column 5 lines 55-65 and columns 8-9 lines 67-05, teaches that high concentrations of nickel causes current to pass therethrough which adversely effects the electrical stability of TFT's. Further, Koyama et al., in Figure 3D and column 4 lines 61-68, teaches a laminate structure (311) of silicon nitride and polyimide. Finally, Koyama et al. teaches that this structure (311) acts as an interlayer insulating film.

It would have been obvious to one of ordinary skill in the art to modify Funai et al. by incorporating a gate electrode comprised by tantalum, as taught by Yamazaki et al., to improve the performance of a TFT device since such technology was well known at the time of the invention. Furthermore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to optimize the concentration difference between the source/drain regions and other regions, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233 (CCPA 1955). Lastly, it would have been obvious to one of ordinary skill in the art to modify Funai et al. by incorporating a silicon nitride and polyimide laminate, as taught by Koyama et al., to provide an interlayer insulator.

Claim 37

Incorporating all arguments of Claim 35 and noting that Funai et al., in column 4 lines 9-14 and column 14 lines 1-5, teaches a catalytic element selected from the group consisting of Fe, Co, Ni, Pd, Pt, Cu and Au.

Claim 39

Incorporating all arguments of Claim 35 and noting that Funai et al., in column 20 lines 18-35, teaches wherein the device of Claim 1 can be incorporated into active matrix liquid crystal displays and organic light emitting elements.

Claims 47, 48, 50 and 52-53

Funai et al. teaches: a silicon active layer containing a nickel catalytic element for promoting crystallization (See column 8 lines 33-38), a gate insulating film interposed between a gate electrode and the active layer (See column 9 lines 44-47), and source/drain regions that contain said nickel catalyst (See column 9 lines 55-64).

Funai et al. fails to explicitly teach a gate electrode comprised by a heat resistant material, wherein the concentration of nickel in the source/drain regions is higher than in other regions which is less than $5x10^{16}$ atoms/cm^3, and wherein a first and second insulating insulator are placed over the device.

However, Yamazaki et al., in column 8 lines 1-10, teaches a gate electrode comprised by tantalum (melting point of 2985 °C). Further, Yamazaki, in column 8 lines 10-15, notes that refractory metals, such as tantalum, are commonly employed because they offer lower resistivities. Further, Funai et al., in column 9 lines 55-64 and Figures 1-12, teaches wherein the concentration of said catalytic element in said source (116) and drain (117) regions is higher than the concentrations in other regions (i.e. – the channel region (118)). Funai et al. specifically points our that high concentrations of nickel are to be avoided in the channel region. Further, Funai et al., in column 5 lines 55-65 and columns 8-9 lines 67-05, teaches that high concentrations of nickel causes current to pass therethrough which adversely effects the electrical stability of TFT's.

Further, Koyama et al., in Figure 3D and column 4 lines 61-68, teaches a laminate structure (311) of silicon nitride and polyimide. Finally, Koyama et al. teaches that this structure (311) acts as an interlayer insulating film.

It would have been obvious to one of ordinary skill in the art to modify Funai et al. by incorporating a gate electrode comprised by tantalum, as taught by Yamazaki et al., to improve the performance of a TFT device since such technology was well known at the time of the invention. Furthermore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to optimize the channel regions concentration, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233 (CCPA 1955). Lastly, it would have been obvious to one of ordinary skill in the art to modify Funai et al. by incorporating a silicon nitride and polyimide laminate, as taught by Koyama et al., to provide an interlayer insulator.

Claim 49

Incorporating all arguments of Claim 47 and noting that Funai et al., in column 4 lines 9-14 and column 14 lines 1-5, teaches a catalytic element selected from the group consisting of Fe, Co, Ni, Pd, Pt, Cu and Au.

Claim 51

Incorporating all arguments of Claim 47 and noting that Funai et al., in column 20 lines 18-35, teaches wherein the device of Claim 1 can be incorporated into active matrix liquid crystal displays and organic light emitting elements.

Response to Arguments

4. Applicant's arguments filed March 24, 2003, have been fully considered but they are not persuasive.

Claims 1-3 and 5-7

Succinctly stated, the Applicant portends that the Office Action of December 18, 2002, fails to elucidate a *prime facie* case of obviousness because "the Official Action has failed to sufficiently show that one of skill in the art would have recognized that the concentration of a crystallization promoting material in a source region and a drain region of an active layer as compared to a concentration of the crystallization promoting material in other regions of the active layer is a result-effective variable", referencing MPEP § 2144.05. The Examiner maintains the original rejection. Funai et al., in column 5 lines 55-65 and columns 8-9 lines 65-05 and column 9 lines 55-65, unequivocally states that nickel in high concentrations effects the electrical characteristics of devices and, as such, should not be included in channel regions (specifically noting Applicant's specification page 3, first full paragraph, which says that by lowering the nickel concentration in the channel region, the characteristics of the TFT can be enhanced). Stated another way, Funai et al. discloses that regions of high nickel

concentration should only be included in source/drain regions and not in channel regions. Therefore, Funai et al. discloses that nickel not only enhances crystallization but can also be a detriment to electrical characteristics of TFT's when incorporated into the channel region in high concentrations. Thus, Funai et al. teaches that nickel is a variable which achieves a recognized result (degradation of electrical characteristics of TFT's when in high concentrations in the channel region).

Conclusion

5. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to David L. Hogans whose telephone number is (703) 305-3361. The examiner can normally be reached on M-F (7:30-4:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead Jr. can be reached on (703) 308-4940. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-1782.

dh DH
June 6, 2003

Carl Whitehead Jr.
CARL WHITEHEAD, JR.
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800